DOCUMENT RESUME

ED 395 579 IR 017 891

AUTHOR Marttunen, Miika
TITLE Argumentation through Computer Conferencing in an Academic Context.
PUB DATE 94
NOTE 12p.; Paper presented at the International Conference on Distance Education in Russia, ICDED'94 (1st, Moscow, Russia, July 5-8, 1994).
PUB TYPE Reports - Research/Technical (143)

EDRS PRICE MF01/PC01 Plus Postage.
DESCRIPTORS *Computer Mediated Communication; Electronic Mail; Foreign Countries; *Group Discussion; Higher Education; *Persuasive Discourse; *Student Attitudes; Student Motivation; Study; *Teleconferencing; Undergraduate Students
IDENTIFIERS *University of Jyvaskyla (Finland)

ABSTRACT

This paper describes a computer conferencing experiment carried out at the University of Jyvaskyla in Finland. The conference provided the students an interactive learning environment appropriate for practicing argumentation and developing their argumentation skills. Participants were 31 undergraduate students. Two tutors, who were top students in the field of education near their graduation, were also recruited for the experiment. Two research questions focused on the students' and tutors' attitudes toward the computer conferencing interactions and computer conferencing as a study method. Four computer conference groups were established: two engaged in the seminar mode and two in the discussion mode of conferencing. The software used was an ordinary electronic mail (Elm) for Unix including a text editor called Emacs. The conference discussions were related to the topics addressed in two set books and the course lectures. A questionnaire was distributed to the students after the course. Both students and tutors found the conference interaction to be constructive and beneficial and a majority of the students found the group discussion to be an effective and motivating mode of study. The discussions were found to be relevant for practicing argumentation. The results reflect the suitability of computer conferencing for higher education. Six tables present students' perceptions of the computer conferencing and the advantages and disadvantages of computer conferencing. (Contains 21 references.) (AEF)

****
* Reproductions supplied by EDRS are the best that can be made *
* from the original document. *
****

ED 395 579

ARGUMENTATION THROUGH COMPUTER CONFERENCING IN AN ACADEMIC CONTEXT

Miika Marttunen, University of Jyväskylä, Finland

Paper presented at the First International Conference on Distance Education in Russia ICDED'94, Russia, Moscow, 5-8 July, 1994

Introduction

The educational potential of computer conferencing (CC) is related to its possibilities to create learning environments suitable for self-directed and collaborative learning as well as facilitated and increased interaction (Harasim, 1990). Mason (1988) emphasizes especially the possibilities of conferencing to support the self-direction among students. She characterizes conference participants as learners who actively search for knowledge and who define their aims and learning demands independently. Along with self-direction, also collaboration and interaction between learners are aspects typical of CC that support the learning process (Kaye, 1992). According to Harasim (1990), active sharing and seeking of information as well as playing with ideas is taking place during conferencing, and thus, the process of idea generating is enhanced. She emphasizes that new ideas are generated when the students respond to readings and comments of other students on some particular topics and as the learner begins to verbalize his/her understanding of the relevant concepts. By the help of the verbalization of the thoughts the development of metacognitive skills such as self reflection and revision are promoted. Gundry (1992) stresses the interactive nature of conferencing and the process of learning from others, not about others as the key characteristics of CC collaboration. In the same vein, Hiltz (1990) suggests that knowledge in the computer conference is not something that is delivered to the students via the medium, but something that occurs and develops in an active dialogue between the learners aiming at understanding and applying the concepts and issues confronted during the interaction. The positive learning effects of collaborative interaction in a CC environment have also been reported in many studies (*e.g.* Davie, 1988; Hiltz & Meinke, 1989; Paulsen, 1992; Burge, 1993; Mason, 1993).

There are experiences on computer conferencing from elementary and secondary levels of education (Tella, 1992; Wells, 1993), but it has been found to be appropriate especially for academic purposes (see Paulsen, 1992; Wells, 1993; Marttunen, 1992, 1993, 1994). The central reason for this is that CC enables increased interaction between participants. For this reason, at the university level conferencing has been used as a forum for interaction and collaboration in connection with both undergraduate and post-graduate courses (Mason, 1993) like also in the working of administrators and researchers (Kaye *et al.*, 1989).

Characteristic of academic interaction is its argumentative nature (*see* Marttunen, in press). Argumentation is needed when relevant reasons are presented in order to convince the audience about the correctness of one's claims or standpoints as well as when other peoples' arguments are assessed. Argumentation is also a tool used when proving the validity of scientific knowledge (Cronbach, 1990). Perry (1981) emphasizes that the understanding of the relative nature of knowledge and the ability to form independent scientific opinions are fundamental characteristics of developed scientific thinking. Such thinking processes presuppose critical evaluation of knowledge and skills to provide evidence in support of one's arguments.

IR017891

U.S. DEPARTMENT OF EDUCATION
Office of Educational Research and Improvement
EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)
☐ This document has been reproduced as received from the person or organization originating it.
☐ Minor changes have been made to improve reproduction quality.
• Points of view or opinions stated in this document do not necessarily represent official OERI position or policy.

"PERMISSION TO REPRODUCE THIS MATERIAL HAS BEEN GRANTED BY

Miike Marttunen

TO THE EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)."

Consequently, practising of argumentation skills is an essential way when aiming at fulfilling the objectives of university teaching: to teach the students the tools needed in scientific thinking.

To engage in interaction with other people has been found to be a relevant and successful way to practise argumentation and critical thinking (Smith, 1977; Colbert & Biggers, 1985). Since computer-mediated communication (CMC), which includes computer conferencing, electronic mail and electronic bulletin boards, provides effective means for establishing interaction, it has been applied in teaching informal argumentation and critical thinking skills (Clark, 1992; Charlton, 1993). In terms of practising these skills, Steinberg (1992; *see also* Marttunen, 1994) stresses the potential of CMC to engage people in focused discussions of alternative points of view by using it. In the same vein, Boyd (1987) emphasizes the suitability of conferencing in providing emancipative learning situations in which argumentation proceeds free from rhetorical tricks and threats or promises typical of ordinary face-to-face debates.

This paper describes a computer conference experiment carried out in the university of Jyväskylä in Finland. The conference provided the students an interactive learning environment appropriate for practising argumentation and developing their argumentation skills. Two research questions were asked: 1) How did the students and the tutors find the CC interactions? 2) How did they find CC as a study method?

Method

Subjects

The computer conference experiment was carried out in connection of a M.Ed level introductory course in the sociology of education at the Department of Education in the University of Jyväskylä, Finland, during the autumn term 1990. The participants, 31 undergraduate students, were recruited to the experiment on a voluntary basis. The majority (58%) of the students were female, 23 years of age or younger (52%) and were in the early stages of their studies (60% of them possessed 60 or less study weeks[1]). In addition, the subjects represented a variety of disciplines, mostly the humanities (45%) and education (15.3%). Two tutors were also recruited to the experiment. They were both top students in the field of education near their graduation. The main criterion for the selection of them was that they were beforehand known as competent to the job, and thus, were recommended by the staff of the university.

Organization of the conference

Four computer conference groups were established: two groups engaged in the seminar mode and two groups in the discussion mode of conferencing. The six week

---

[1]In the Finnish higher education system 'a study week' is a concept used in assessing the extent of studies. One study week corresponds to about 40 hours of work.

computer conferencing consisted of argumentative discussions between the students in each particular group.

The software used in organizing the conference was an ordinary electronic mail (Elm) for Unix including a text editor called Emacs. Elm was equipped with a mailing list containing the addresses of all the participants of the conference. Hence, the program delivered the messages sent in one group to all the other students and the tutor in that particular group.

The conference members did not know each other personally beforehand, and they also had the possibility to remain anonymous during the studies. Only the conference organizers knew the students' real names. None face-to-face meetings were organized during the conference. Only a single face-to-face session was held prior to the conference in order to get the students familiar with the use of the computer terminals and the mailing program.

The conference discussions were related to the topics addressed in the two set books (Broady, 1986; Takala, 1989) and the course lectures. The main contrast between the different modes of conferencing was that in the discussion mode the conference topics were selected by the students together while, in contrast, in the seminar mode by the tutor. In addition, the tutor's general role in the seminar mode resembled that of a teacher and a leader but in the discussion mode, rather, that of a co-worker and a resource person.

Studying in the conference was interactive in nature: the students' texts consisted of their own ideas and thoughts as well as comments relating to the other students' texts. The participants were supposed to write at least two messages a week in order to pass the course and earn the credit (3 study weeks). The conference study acted as an alternative way for the students to complete the course. The other students of the course (N=193) engaged in the traditional self-study of the books.

The main criterion for the selection of this particular course of sociology of education was that the books included in the course contained issues dividing opinions and, hence, suitable for argumentation and debates. Issues of this kind were, for example, 'the hidden curriculum in school' (Broady, 1986) and 'sex roles in school' (Takala, 1989).

Practising of argumentation in the conference

The didactic content of the conference studies was argumentation itself. A short literature review on argumentation was posted to students and tutors before the studies in order to acquaint the participants with the concept and procedural structure of argumentation. Hence, the review acted as a helping aid for the students when formulating their messages.

Studying in the conference consisted of the students' argumentative contributions related to the topics addressed in the set books and lectures. During the conference studies the students were directed to present in their texts a lot of their own opinions and points of view related to the discussion topics as well as to critique the other students' opinions and standpoints. In addition, the students were directed to defend themselves by presenting counter-arguments when critiqued by other students.

The aim of the conference was to create a collaborative learning environment in which the students are engaged in a constructive dialogue and debate. Hence, they were offered an opportunity to make use of the peer students' opinions and

alternative approaches to topics under examination. Furthermore, special attention was paid to grounding by asking the students to present carefully considered reasons in order to support all their opinions and critical comments.

Data collection and analysis

The questionnaire was posted to the conference students after the course, and all were returned except one. The questionnaire included closed questions in which the Likert-scale was applied, as well as open-ended questions. The questions were related to the students' perceptions of the CC interaction and their evaluation on conferencing as a study method. In the questions focusing on the nature of interaction the students were asked to evaluate a) the messages sent by the tutors, b) the messages sent by the other students, c) the discussions as a whole, d) some general aspects as well as their intentions when formulating their own texts. In addition, the students were asked to evaluate the strengths and weaknesses of CC study and answer some other questions relating to their experiences from conferencing as a part of university studies.

In the analyses of the closed questions, the frequencies of the answers to different categories were calculated. Some Likert-scale categories were merged when it proved relevant. In the analyses of the open-ended questions, the researcher searched for those aspects in the students' answers that occured most frequently. In addition, the researcher organized separate meetings with the tutors after the experiment in which the qualities of CC were discussed. The tutors were asked to evaluate the relevance of the conference study in terms of practising argumentation and as a study method for academic purposes. The discussions were tape-recorded. In the analyses the researcher focused on those points in the discussions that included information related to the research questions.

Results

The results presented in the following describe the students'and the tutors perceptions of the conference interaction and their other experiences concerning the CC experiment.

Students' perceptions of the messages sent by other conference participants

Tables 1, 2 and 3 describe the students' perceptions of the messages sent in their own group during the conference.

Table 1. *Students' (N = 30) perceptions of the nature of the tutor's messages*

The students found that the tutors' messages included	Very much (f)			Quite a lot (f)			Only a little (f)			Not at all (f)		
	S[1]	D[2]	T[3]	S[1]	D[2]	T[3]	S[1]	D[2]	T[3]	S[1]	D[2]	T[3]
Motivating and encouraging material	1	1	**2**	9	5	**14**	5	9	**14**	0	0	**0**
Critique	0	0	**0**	4	5	**9**	10	9	**19**	1	1	**2**
Feedback on subject matters	0	0	**0**	8	5	**13**	7	9	**16**	0	1	**1**
Personal feedback	0	0	**0**	1	1	**2**	5	10	**15**	9	4	**13**
Material useful in analysing the study of the books	0	1	**1**	11	5	**16**	4	3	**7**	0	6	**6**
Material useful in summarizing the issues studied	1	0	**1**	10	5	**15**	4	5	**9**	0	5	**5**
Considerate/empathetic material	0	0	**0**	8	9	**17**	6	4	**10**	1	2	**3**
Rude material	0	0	**0**	0	0	**0**	1	3	**4**	14	12	**26**
Encouragement to argumentation	6	3	**9**	8	9	**17**	1	3	**4**	0	0	**0**

[1] Seminar mode, [2] Discussion mode, [3] Total

Table 2. *Students' (N = 30) perceptions of the nature of the feedback they received from other students*

The students found that in the other students' messages	Often (f)			Sometimes (f)			Never (f)		
	S[1]	D[2]	T[3]	S[1]	D[2]	T[3]	S[1]	D[2]	T[3]
They got positive feedback	8	2	**10**	6	9	**15**	1	4	**5**
They got negative feedback	1	1	**2**	8	9	**17**	6	5	**11**
They got evil-minded criticism	0	0	**0**	1	2	**3**	14	13	**27**
They got constructive critique	1	1	**2**	10	13	**23**	4	1	**5**
They were discouraged by others	0	0	**0**	1	2	**3**	14	13	**27**
They got encouragement	1	1	**2**	11	8	**19**	3	6	**9**
They got positive advice	0	0	**0**	8	7	**15**	7	8	**15**
They got negative advice	0	0	**0**	2	3	**5**	13	12	**25**
They received considerate treatment	7	7	**14**	7	7	**14**	1	1	**2**

[1] Seminar mode, [2] Discussion mode, [3] Total

Table 3. *Students' (N = 30) perceptions of the nature of the discussions as a whole*

The students found that the messages during the CC study included	Much (f)[4]			A little (f)			A bit or not[5] at all (f)		
	S[1]	D[2]	T[3]	S[1]	D[2]	T[3]	S[1]	D[2]	T[3]
Evil-minded criticism	0	1	**1**	2	3	**5**	13	11	**24**
Constructive critique	10	8	**18**	5	6	**11**	0	1	**1**
Discouraging of others	0	0	**0**	1	2	**3**	14	13	**27**
Encouraging of other	12	5	**17**	3	4	**7**	0	6	**6**
Pompous behaviour	3	3	**6**	4	6	**10**	8	6	**14**
Positive advising	10	6	**16**	4	6	**10**	1	3	**4**
Negative advising	0	1	**1**	4	6	**10**	11	8	**19**
Considerate treatment of others' opinions	13	12	**25**	2	2	**4**	0	1	**1**
Presenting opinions with too weak support	3	5	**8**	5	8	**13**	7	2	**9**
Too direct summarizing of the books	3	4	**7**	4	5	**9**	8	6	**14**

[1] Seminar mode, [2] Discussion mode, [3] Total, [4] The categories 'very much' and 'quite much' in the original scale are connected, [5] The categories 'a bit' and 'not at all' in the original scale are connected

The results in Tables 1, 2 and 3 indicate that the students found the conference interaction to be constructive and beneficial. A majority of them (16/30) reported that the tutors' messages (Table 1) included a lot or quite a lot of motivating and encouraging material; none of the students thought that there had not been any material of that kind. Similarly, according to a majority (27/30) of the students, the tutors' messages included a lot of encouragement to argumentation. In the students' evaluation concerning the fellow students' messages (Table 2) they characterized the feedback and advice in the messages to be positive rather than negative in nature. In addition, they reported that the fellow students' texts included mainly constructive critique, and that only seldom evil-minded criticism. The students' overall impression of the discussions in their own group (Table 3) was quite similar compared to their evaluation on the nature of the feedback they received. A majority (18/30) of the students reported that the messages included much constructive critique, encouragement (17/30), positive advice (16/30), and considerate treatment of other students' opinions (25/30).

Students' perceptions of their own messages

Tables 4 and 5 describe how the students found their own messages.

Table 4. *Students' (N = 30) perceptions of some general aspects relating to their own messages*

The students assessed their own messages in the following way:	Often (f)			Sometimes (f)			Never (f)		
	S[1]	D[2]	T[3]	S[1]	D[2]	T[3]	S[1]	D[2]	T[3]
I hesitated in sending them	0	2	**2**	9	9	**18**	6	4	**10**
I cancelled a message I had already completed	0	0	**0**	1	2	**3**	14	13	**27**
I formulated them with care	8	8	**16**	7	5	**12**	0	2	**2**
I was hasty in formulating them	1	1	**2**	9	13	**22**	5	1	**6**
I presented such things that I would not have presented in a face-to-face situation	1	1	**2**	7	8	**15**	7	6	**13**

[1] Seminar mode, [2] Discussion mode, [3] Total

Table 5. *Students' (N = 30) perceptions of their intentions when formulating their messages*

According to the students, the following described their activities during the CC study	Well (f)[5]			Cannot say (f)			Badly (f)[6]		
	S[1]	D[2]	T[3]	S[1]	D[2]	T[3]	S[1]	D[2]	T[3]
I tried to comment actively on others' messages[4]	12	9	**21**	0	1	**1**	2	5	**7**
I drew on the books when presenting my opinions because I did not find myself competent to present my own views	2	6	**8**	0	2	**2**	13	7	**20**
I tried to participate in the on-going debates	9	10	**19**	3	1	**4**	3	4	**7**
I tried to create a debate by presenting intentionally sharp and provocative opinions	8	7	**15**	3	3	**6**	4	5	**9**
I tried to open discussion by presenting new points of view	10	6	**16**	5	4	**9**	0	5	**5**
I tried to initiate debates by provoking others	4	3	**7**	3	2	**5**	8	10	**18**
I tried to present a lot of my own thoughts and opinions[4]	15	14	**29**	0	0	**0**	0	0	**0**
I avoided presenting matters differently from the way they were presented in the books because I did not want to distort them	4	1	**5**	2	0	**2**	9	14	**23**
I paid special attention to the grounding of my opinions	10	7	**17**	4	5	**9**	1	3	**4**
I tried to take a personal stance on the matters presented in the books	13	15	**28**	1	0	**1**	1	0	**1**
I tried to include my own experiences in my messages	14	13	**27**	1	0	**1**	0	2	**2**
I tried to find weaknesses in the groundings of others	3	3	**6**	5	4	**9**	7	8	**15**

[1]Seminar mode, [2]Discussion mode, [3]Total, [4]One case is missing, [5]The original categories 'very well ' and 'quite well' are connected [6]The original categories 'quite badly' and 'very badly' are connected

On the basis of the students' evaluations concerning their own messages (Table 4) it can be said that they prepared them with care rather than in a hurry. In addition, typical of the students' experiences was that all except one student got disappointed, at least sometimes, because their message was never commented on. A majority (17/30) of the students reported also that during the conference they presented such things that they would not have presented in a face-to-face situation (Table 4).

When the students were asked about their intentions in formulating their messages (Table 5) all of them (29/29) reported that they tried to present a lot of their own thoughts and opinions. In addition, a majority (21/29) of the students reported that they tried to comment on the other students' messages, participate in the on-going debates (19/30), open a discussion through presenting new points of view (16/30), paid a special attention to the grounding of their opinions (17/30), aimed at taking a personal stance on the matters presented in the books (28/30), and tried to include their own experiences in their messages (27/30). Finally, when the students were presented an open-ended question and asked to express what they regarded as their most important task in formulating their texts the most frequent answer was 'presenting well grounded own opinions'.

Students' perceptions of computer conferencing as a study method

The students were also asked to report on their other experiences concerning computer conferencing and how they found it as a study method. A majority (25/30) of the students found the support of the group to be beneficial during the studies, reported on the feeling of togetherness in their group (24/30), as well as reported on a high motivation to study (25/30). In addition, all except one student found conferencing to be a suitable method for themselves, and a majority (27/30) of them reported on their personal willingness to complete another corresponding course in the same way.

When the students were asked about the frequency of personal meetings needed with other group members during conferencing, 5 students answered that such meetings should be organized 'frequently', the answer of half (15) of the students was 'now and then', and 10 students found such meetings to be unnecessary. In addition, 18 students estimated the amount of work during the conference to be greater than needed in a traditional self-study of the books, 7 of them found the amount of work to be similar, and 4 students found it smaller. However, 22 students regarded the amount of the work as optimal compared to the three study weeks they earned through completing the course. Only 7 students regarded the amount of work as too high and one student as too little.

The advantages and disadvantages of CC reported by the students are presented in Table 6.

Table 6. *The advantages and disadvantages of computer conferencing reported by the students*

	S[1](f)	D[2](f)	T[3](f)	T[3](%)
Advantage				
Possibility to plan one's own timetables	8	9	17	57
Offered a possibility and made to consider the contents	3	9	12	40
Offered an equal and free athmosphere for participation	4	7	11	37
The different point of view of the peer students taught to think about the matters from various perspectives	4	5	9	30
Offered an alternative way to compltete the course	5	4	9	30
Offered a possibility to exhange opinions	2	5	7	23
Developed the computing skills	4	2	6	20
Developed skills in critical thinking and debating	4	1	5	17
An independent way of studying	0	5	5	17
Freed from exam pressure	3	2	5	17
Disadvantage				
Laborious way to study	6	4	10	33
Lack of face-to-face contacts	3	5	8	27
Problems with the computers (terminals occupied, technical problems, unable to use)	1	6	7	23
Lack of discussion and critical comments	3	2	5	17

[1]Seminar mode; [2]Discussion mode; T[3]Total

A remarkable finding (Table 6) was that advantages of computer conferencing were found more often than disadvantages. An advantage mentioned by more than a half of the students was that conferencing enabled the independent planning of one's timetables. The other most frequently mentioned advantages were that CC made the participants to consider the contents of the course and that it offered an equal and free way to participate in the discussions. The main disadvantages of CC were a large amount of work it demanded and the lack of face-to-face contacts.

Tutors' perceptions of the computer conference interaction

The tutors' evaluations on the conference support those of the students. According to the tutors, the discussions included a lot of grounded opinions and critique towards others' statements. In addition, the tutors mentioned that some new groups were also developed between some students in which debate and argumentation proceeded in a lively fashion. However, the tutors found the conferencing sometimes too demanding for the students in the early stages of their studies. This was manifested by the occasionally extremely inadequate reasons for supporting the opinions presented. A significant weakness of conferencing mentioned by the tutors was the large amount of work it demanded. Especially in the seminar mode of conferencing, in which the role of the tutor resembled that of a teacher, the tutors found it quite laborious to provide regular feedback to the students. As a whole, the tutors estimated the amount of work conferencing needed from them to be much greater than that needed in a traditional way of working (i.e. the preparation of the exam questions and the evaluation of answers).

Conclusions

The results relating to the students' and tutors' experiences lend support to the view according to which computer conferencing in well-suited for higher education purposes. This was indicated by the results suggesting that the CC discussions were argumentative in nature and, thus, relevant in terms of practising argumentation. Moreower, the students found the discussions to be a motivating and sensible way to study.

In addition, the results indicated that the typical characteristics of conferencing, the possibility for collaboration with other students and self-directed learning, were realized during the study. The support of the other members of the group as well as the possibility to organize the studies independently were regarded as essential advantages of conferencing. These results reflect, more broadly, the suitability of conferencing to adult education in which, according to Knowles (1990), especially self-direction of the learner and the possibility to be responsible for one's own studies are aspects that should be promoted. Consequently, conferencing can be regarded as an appropriate way to organize studies not only in a higher education context, but in other adult education settings as well.

References

Boyd, G. (1987) Emancipative educational technology. *Canadian Journal of Educational Communication* 16 (2), 167-172.

Broady, D. (1986) *Piilo-opetussunnitelma (The hidden curriculum).* Tampere: Vastapaino.

Burge, E. (1993) *Students' perceptions of learning in computer conferences: a qualitative analysis.* Unpublished doctoral dissertation. University of Toronto, Canada.

Byrne, M. S. & Johnstone, A. H. 1987. Critical thinking and science education. *Studies in Higher Education* 12 (3), 325-339.

Charlton, S. (1993) Meeting educational needs in an information society. Delivering an on-line critical thinking course. In G. Davies & B. Samways (eds) Teleteaching. *Proceedings of the IFIP TC3 third teleteaching conference, TeleTeaching 93,* Trondheim, Norway, 20-25 August. Amsterdam: Elsevier Science Publishers B. V., 789-795.

Clark, G. C. (1992) Debate, electronic style. *Instructor,* February, 57-58.

Colbert, J. R. & Biggers, T. (1985) *The academic and practical values of debating.* ERIC Document Reproduction Service No. ED 265 586.

Cronbach, L.J. (1990) *Essentials of psychological testing* (5th ed.) (New York, HarperCollins).

Davie, L. (1988) Facilitating adult learning through computer-mediated distance education. *Journal of Distance Education* 3 (2), 55-69.

Gundry, J. 1992. Understanding collaborative learning in networked organizations. In A. Kaye (ed.) *Collaborative learning through computer conferencing.* Berlin: Spinger-Verlag, 167-178.

Harasim, L. M. (1990) Online education: an environment for collaboration and intellectual amplification. In L. Harasim (ed.) *Online Education. Perspectives on a new environment.* New York: Praeger; 39-64.

Hiltz, S. R. (1990) Evaluating the virtual classroom. In L. Harasim (ed.) *Online education. Perspectives on a new environment.* New York: Praeger.

Hiltz, S. R. & Meinke, R. (1989) Teaching sociology in a virtual classroom. *Teaching Sociology* 17 (4), 431-446.

Kaye, A. (1992) Learning together apart. In A. Kaye (ed.) *Collaborative learning through computer conferencing.* Berlin: Spinger-Verlag, 1-24.

Kaye, T., Mason, R. and Harasim, L. (1989) *Computer conferencing in the academic environment*. Institute of Educational Technology. Centre for Information Technology in Education. Report No. 91, Milton Keynes.

Knowles, M. (1990) *The adult learner. A neglected species*. Houston: Gulf Publishing Company.

Marttunen, M. (1992) Commenting on written arguments as a part of argumentation skills - comparison between students engaged in traditional vs on-line study. *Scandinavian Journal of Educational Research* 36 (4), 289-302.

Marttunen, M. (1993, August). *Argumentative online studying in higher education*. Paper presented at the international conference, TeleTeaching'93, Trondheim, Norway.

Marttunen, M. (in press) Assessing argumentation skills among Finnish university students. *Learning and Instruction*.

Marttunen, M. (1994) *Teaching argumentation skills in a computer conference environment*. Manuscript submitted for publication. (Copies available from author.)

Mason, R. (1988) Computer conferencing: A contribution to self-directed learning. *British Journal of Educational Technology* 19 (1), 28-41.